Integrating Literacy and Science

Introduction:

Many of us in Colorado are looking for innovative and simple ways to improve our students' test scores, avoid creating classrooms of glib parrots, and truly address the educational needs of our students. Many of us face obstacles like using textbooks that are too easy or too difficult for our students to comprehend, attempting to motivate apathetic students, and of course the reality that socio-economic factors do affect students' learning. This introduction *Integrating Literacy and Science* accompanies this curriculum, because it is filled with simple suggestions that work. By using these suggestions, students will build vocabulary within context, develop a clearer understanding of the English language, and be able to use the science content they are learning from the activities presented. Service-learning is effective only when we are able to match it to the standards in a way that encourages student comprehension, retention, and performance. If our students are not able to use the skills and content that we are teaching, then we need to find ways of facilitating that learning process. These practices are intended for all grade levels and can be used in any content area.

Educational practices in Colorado have vacillated between facilitation methods that work for one or two learning styles, that prepare students only for an exam (CSAP), and that do not always result in the long-term critical and analytical thinking skills that we would like to see our kids using. The scary thing is that some educators are being encouraged to skill and drill the kids to the point that they can repeat back information long enough to take the CSAP, and since science is tested only once, its value is not recognized as clearly. Unfortunately, these kids still are not able to *use* their knowledge. If we are going to prepare students to become the next generation of professionals in a technically advanced society, we need to teach them *how to learn* and *how to study*; they need to master literacy skills to use science content. OK, so how do we do that without it taking too much time?

Comprehension:

Integrating literacy skills and science content is really simple and it strengthens students' abilities in both subjects. First, students cannot learn new material if they are addressing words that they do not know. When anyone attempts to study new material, that person must be literate enough to comprehend the information. All too often, vocabulary is not a major consideration in ensuring that students are able to accept the new challenge of studying new material. Therefore, the vocabulary that is particular to each unit must be referenced for the students before beginning the content study. Just catching students up on their vocabulary will make an enormous difference in their comprehension levels with the material. As well, testing the students daily on their content information is vital. Doing this in any two-dimensional format works perfectly. Asking students to draw or sketch out information, answer a couple of short questions, or diagram, chart, or graph their understanding puts their content learning into an understandable, usable format.

Application:

Knowledge is useless unless it can be applied. Kids recognize this immediately, which is why they do not always understand why they learn to write research papers but love to perform science experiments. They can see the results of the experiments but cannot see the results of research. Studying science content through reading textbooks also seems useless to kids because they are still lacking that end result.

All content information that students learn in science should be applied in literacy (suggestions are listed below). This allows students to process their content information into a coherent form of communication. It is also a very practical application of their learning, because scientists are frequently expected to write reports, document findings, and publish articles on their work. The service project is another method of applying learning. With the service project, students not only apply the information that they have learned but feel a deeper sense of connectedness to their community as well. Completing a service project

allows a student (or anyone really) to recognize how problem solving techniques can be applied in an immediate manner, appreciate to value of employing relevant information, and manipulating science in a way that benefits many right away. It brings science closer to home by making it relevant.

Literacy applications for science content:
Write a research paper using research found in a particular unit, write a persuasive essay or letter to convince someone of importance to agree with certain findings and their effects, document research findings and observations in a journal format, write descriptive essays or documents showing how learning is enfolding in a unit, write a letter to the editor to express that some change or recognition needs to be made, write descriptively about information learned for younger students to learn, create historical fiction or fantasy stories that use scientific information learned to express a persuasive point, summarize daily information learned into a journal (great for studying).

Obstacles to Literacy:
We have all run into strange instances, where we just did not understand why a student did not comprehend information, why we taught one concept fifteen times but the students did not pass the exam, and why one or two students consistently drift off to sleep while reading. These are great cues for educators that indicate an obstacle to studying exists. The student is stuck in one way or another and actually cannot learn for a short time. If we can recognize and handle these obstacles, then we can keep our students more coherent and ultimately improve learning.

Literacy Obstacle: The Undefined Word:

Purpose: The most detrimental barrier to study is the undefined word. When a student reads over words that he does not know and does not look them up, he goes mentally blank, making learning temporarily impossible. If we intend to keep students interested and on task, we need to address the physiological phenomenon that occurs when a student is exposed to an undefined word.

How to Spot it: When a person is reading (or listening in class) and goes past a word that he does not know, his mind will go blank after that word. Have you ever read a whole page then were unable to recall what you had read? You missed a word someplace. When a student goes past a word he does not know, he will become very tired, fall asleep, or become nervous and confused.

How to Avoid it: Define any words that are new for students, especially words that they should have learned in the past but may too embarrassed to ask about. Make dictionaries available to students in class. Insist that students read and study only with a dictionary on the table alongside their textbooks. Finally, model proper technique by reading with a dictionary in front of the students or look up words as you are covering material and run across a undefined word of your own. The whole notion of guessing what a word is by looking at its context has not helped to improve our cultural vocabulary; we are all glibly guessing at definitions as we read half asleep.

How to Solve it: There is a section following called Defining Words that explains how to do this specifically. Basically, find the word and look it up.

Defining Words:
No, no one is trying to insult your intelligence by listing out exactly how to look a word up in the dictionary. This section is included so that you can copy it and give to your students so that you don't need to spend time creating the same thing.

An undefined word (or a group of undefined words) will literally make it impossible for a student to continue learning a subject, because he has so many unknowns, making the content seem impossible to grasp (and making him really sleepy). The first thing to do is teach this as a daily procedure that anytime a student hears or reads an undefined word, he needs to look it up right away. The method of teaching students to guess at a word's meaning by looking at its context has created millions of Americans who are barely literate, as we just don't know the meanings of our own language.

1. The student is showing signs that he has read an undefined word (sleepy, nervous, confused, asleep).
2. Ask the student to tell you the last thing he remembers understanding about the text. That is where the undefined word is located. Skim over the section, asking him if he knows certain definitions (even common words like *though, is,* and *because* are frequently not understood).
3. Now that you have at least one word that the student cannot give you a satisfactory definition for, ask him to look up the word before continuing.
4. To Look up a word: Read the dictionary definition. Write it down (until this can be done easily enough to become a mental process).
5. Rewrite the definition into your own words so that it makes sense.
6. Write down the part of speech (noun, adjective, preposition, etc.) for the word.
7. Write out the origin for the word (Old French,, Latin, Greek, Old English, etc.)
8. Write out 3-10 sentences, using the word correctly until you feel that you understand it thoroughly.
9. Go back and reread the section that contained the word.
10. Look up the next word you come across.

Steps for Students:

1. Read the dictionary definition. Write it down.
2. Rewrite the definition into your own words so that it makes sense.
3. Write down the part of speech (noun, adjective, preposition, etc.) for the word.
4. Write out the origin for the word (Old French,, Latin, Greek, Old English, etc.)
5. Write out 3-10 sentences, using the word correctly until you feel that you understand it thoroughly.
6. Go back and reread the section that contained the word.
7. Look up the next word you come across.

Why Use Literacy Skills and Science Content Together?:

How simple is it to teach students their content information when they are unable to read the textbooks? It is almost impossible. Yet if science teachers had just a few simple steps that could be taken in classes that built students' scientific vocabulary and developed their reading skills, then teaching that content becomes significantly more successful. Many of us have taught or been taught to pass over words that we do not understand, as though having a well-rounded vocabulary was a waste of time. Now we all face students who make constant incorrect guesses, have incredibly low vocabularies, and perform poorly in more than one subject area. By combining literacy and science (to an extent), science content becomes more significant, literacy skills improve, and students walk away from school more capable of performing intellectually. As well, service-learning must integrate both skills and content to be an effective delivery method. As a language arts teacher, I wanted to give science teachers some simple tools that would not take a lot of time to use in classrooms to help their students. I use these methods in my classroom (as does my whole team), and they honestly work wonders!

Literacy & Science Integration Checklist:

- ✓ Are dictionaries available to students at all times?
- ✓ Do kids recognize the reasons why they are studying a particular subject (comprehension)?
- ✓ Is their learning being applied with a service-learning project (application)?
- ✓ Are lots of pictures, videos, and demonstrations being used in teaching (comprehension)?
- ✓ Are students being assessed daily using sketches, demonstrations, and images (comprehension)?
- ✓ Are the steps slow enough for the lower students?
- ✓ Are higher leveled students being challenged with quicker steps?
- ✓ Are undefined words being looked up?
- ✓ Are students using dictionaries to understand the words used in texts?

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